

**ARIZONA GAME AND FISH DEPARTMENT  
HABITAT PARTNERSHIP PROGRAM  
HABITAT ENHANCEMENT AND WILDLIFE MANAGEMENT PROPOSAL**

**PROJECT INFORMATION**

<b>Project Title:</b> Support of wildlife-highway research and conflict resolution	<b>Project No.</b>
------------------------------------------------------------------------------------	--------------------

<b>Region/Branch/GMU:</b> Research/GMUs 6A, 7E&W, 10, 22, 23	<b>HPC:</b>
--------------------------------------------------------------	-------------

**Project Type:** Research and support of highway reconstruction adaptive management

**Project Description:** The AGFD Research Branch has been conducting wildlife-highway research since 2001 along State Route 260. This research has increased our knowledge of wildlife-highway relationships and helped make this highway safer, reduced elk-vehicle collisions by >80%, promoted wildlife permeability across the highway, and garnered substantial public awareness and national acclaim. Research on State Route 260 continues for 2 more years (\$166,000 ADOT funds) and has now been expanded to several other highways in northern Arizona, including Interstate 17 elk movements (\$250,000 in ADOT funds), US Highway 89 pronghorn movements (\$197,000), and State Route 64 elk, mule deer and pronghorn movements (\$195,000). All of these projects will provide data allowing ADOT to proactively resolve conflicts with wildlife, including supporting and determining the location of passage structures, extent of ungulate-proof fencing to funnel animals to passages, and other mitigation measures. The AGFD Research Branch also supports this research with State Wildlife Grant funds. However, as part of the ADOT funding, AGFD must provide 20% non-Federal funding match, which has become increasing difficult to secure, especially as the amount of ADOT funding has increased. The requested HPC funds will enhance our ability to conduct effective wildlife-highway research and pursue progressive mitigation strategies to resolve conflicts, will help AGFD meet its non-Federal match requirement such that it can accept ADOT funding, and gain the support and “buy-in” of HPC partner organizations.

**Wildlife Species to Benefit:** Primarily elk, pronghorn and mule deer (though all species will benefit)

**Possible Funding Partners:**

**Implementation Schedule:**

**Beginning:** September 2007

**Completed:** December 2009

**PROJECT FUNDING**

**SBG Funds Requested:** \$80,000 over 2 years

**Cost Share Funds:** \$808,000 ADOT over 2 years  
\$150,000 AGFD State Wildlife Grant funds over next 2 years

**Total Project Costs:** \$1,028,000 over 2 years

**PARTICIPANT INFORMATION**

<b>Applicant:</b> Norris L. Dodd, Research Biologist (please print) Research Branch, AGFD <b>Telephone:</b> (928) 367-5675 Office (928) 368-3017 Cell	<b>Address:</b> Research Branch (WMRS) 2221 W. Green way Road Phoenix, AZ 85023
----------------------------------------------------------------------------------------------------------------------------------------------------------------	---------------------------------------------------------------------------------------

**AGFD Contact and Phone No. (If applicant is not AGFD personnel)** N/A

<b>Coordinated with:</b> Estomih Kombe, Arizona Transportation Research Center	<b>Date:</b> Various dates and February 27, 2007
-----------------------------------------------------------------------------------	-----------------------------------------------------

Arizona Department of Transportation	
<b>Applicant's signature:</b>	<b>Date:</b>

**SEND COMPLETED APPLICATIONS TO:**

**Game Branch  
2221 W. Greenway Rd.  
Phoenix, AZ 85023  
mdisney@azgfd.gov**

**NEED STATEMENT/PROBLEM ANALYSIS:**

Direct and indirect highway impacts have been characterized as some of the most prevalent and widespread forces altering natural ecosystems in the U.S. The direct impact of collisions with motor vehicles is a significant source of mortality affecting wildlife populations. Over a million deer alone are killed annually on U.S. highways. Wildlife-vehicle collisions cause human injuries and deaths, tremendous property damage and substantial loss of recreational opportunity and revenue associated with sport hunting. It's been estimated that highways have affected >20% of the U.S. land area through habitat loss and degradation. Perhaps the most pervasive impact of highways on wildlife are barrier and fragmentation effects resulting in diminished habitat connectivity and permeability. Highways block animal movements between seasonal ranges or other vital habitats. This barrier effect fragments habitats and populations, reduces genetic interchange, and limits dispersal of young, all serving to disrupt viable wildlife population processes. Long-term fragmentation and isolation renders populations more vulnerable to stochastic events that may lead to extinctions. Though numerous studies have alluded to highway barrier effects on wildlife, few have yielded quantitative data relative to animal passage rates, particularly in an experimental (e.g., pre- and post-construction) context, as has been done for elk along State Route 260.

We used Global Positioning System (GPS) telemetry to find that elk passage rates along State Route 260 dropped 50%, from 0.86 to 0.43 when the upgraded highway was completed and opened to traffic. Permeability documented for other wildlife species has been considerably lower; the passage rate for wolves was only 0.06 along the Trans-Canada Highway in Alberta. In Montana, grizzly bear highway crossing frequency from GPS telemetry was compared to simulated random walk analyses to assess permeability; observed bear crossing frequency was 31% of simulated. Caribou crossed actual roads <20% as frequently as simulated networks. Compared to these and other large mammal species, the barrier effect from highways appears to affect no species as much as it does pronghorn; during extensive prior VHF-telemetry studies in northern Arizona, no successful pronghorn crossing of a paved and fenced highway was documented. The fragmentation of northern Arizona's pronghorn herds by highways has contributed to isolation of populations and prevention of seasonal migration, contributing to reduction of pronghorn populations. With increasing human development and traffic volume on highways within pronghorn habitat that already constitute barriers to pronghorn movement pronghorn are a species of considerable concern.

Wildlife passage structures have shown tremendous benefit in promoting wildlife passage for a variety of wildlife species, and in conjunction with fencing have reduced the incidence of wildlife-vehicle collisions and promoted both effective underpass use by wildlife and highway permeability. Along State Route 260, we found that after ADOT strategically fenced 50% of a section of highway based on our GPS data, the incidence of elk collisions declined >80% (from 51 in 2004 to 8 in 2005). We further found that the elk highway passage rate after the highway was opened to traffic but before fencing was erected (0.54 crossings/approach) was 31.6% lower than the level

determined for the section during reconstruction (0.79). Once fencing was erected, the passage rate increased 52% (0.82) showing how underpasses and fencing can jointly promote better and safer highways for people and wildlife alike (see attached *Arizona Wildlife Views* article).

Our research along State Route 260 has been ongoing since 2001 and continues for 2 more years; it is currently funded by a \$166,000 grant from ADOT. Much of this research is now focused on determining and evaluating methods (e.g., inexpensive fencing options) that ADOT can use to “retrofit” existing highways to address wildlife-highway conflicts. We have completed the first year of a “pilot study” along Interstate-17 south of Flagstaff, focusing on elk movements determined from GPS. Preliminary data from 5 of 14 collared elk point to the high barrier effect associated with high traffic volume Interstate-17 (see attached map). This and the high incidence of elk-vehicle collisions have made this highway a priority for future action. A new comprehensive Interstate-17 research project will be funded this spring by ADOT (\$250,000). Data from our ongoing pilot study and the new project will be used by ADOT’s Flagstaff District to begin the process of retrofitting existing bridges and box culverts as wildlife passage structures with fencing, with anticipated benefits similar to State Route 260. In January 2007, we initiated a new research project along US Highway 89, north of Flagstaff focusing on pronghorn movements determined from GPS telemetry; this project is funded by ADOT for \$197,000. This project will yield data that will refine proposals for the reconstruction of this highway to accommodate pronghorn passage and to promote permeability. ADOT will be funding yet another new research project this spring (\$195,000) along State Route 64, between Williams and the Grand Canyon. This project will address substantial collision and permeability issues along this highway that affect pronghorn, elk, and mule deer. The Department’s Research Branch also financially supports this research with State Wildlife Grant funds. However, as part of our ADOT funding, we must provide 20% non-Federal funding match, which has become increasingly difficult to secure, especially as the amount of ADOT funding has increased. HPC funding will help us meet this non-Federal match requirement.

This HPC proposal and the research that it will fund directly address several of the resource management objectives and strategies identified under the *Wildlife 2012 Strategic Plan’s* wildlife theme to help address the trend associated with “habitat fragmentation and degradation from networks of roads....” In particular, this project will address the key management objective to develop strategies to “maintain or improve the quality and connectivity of habitats to support a diversity of wildlife species” in the highway context. This proposal addresses multiple identified resource management strategies, including:

- Collect and analyze scientific information for use in decision making (e.g., by ADOT).
- Establish guidelines for managing wildlife populations and their habitats that balance the uses of lands and waters with the public’s values to ensure sustainability of wildlife populations.
- Use available tools and resources and develop new ones to conserve and preserve wildlife habitats and populations (e.g., develop and evaluate various highway mitigation tools and approaches).
- Coordinate with partners to manage wildlife populations and their habitats (e.g., ADOT, HPC partners).
- Manage wildlife with consideration of social and economic factors (e.g., better highways for people and wildlife).

## **PROJECT OBJECTIVES:**

The specific objectives of this HPC project proposal are to:

- Support ongoing and new wildlife-highway relationships research projects throughout Arizona that will contribute to increased understanding of how highways affect wildlife and how we can effectively mitigate such impacts.
- Support the development of specific mitigation strategies to address the impact of highways on

wildlife, with direct benefit to elk, mule deer, pronghorn, and a multitude of other species.

- Promote highway safety associated with reduced wildlife-vehicle collisions.
- Promote wildlife permeability across highways and landscape connectivity associated with strategies to resolve wildlife-highway conflict.
- Increase hunting and non-consumptive recreational opportunities associated with reduced wildlife-vehicle collisions and enhanced wildlife population viability from improved permeability and connectivity.
- Allow us to meet our ADOT non-Federal match grant requirement such that we can fully utilize all available research funding.
- Increase the involvement, “buy-in”, and promotional and advocacy opportunities for interested and affected HPC partners in our research and highway management activities.

### **PROJECT STRATEGIES:**

This proposal would help fund wildlife-highway research, much of it GPS-telemetry based, as determined in separate project research scopes of work for each highway research project. Each of these research scopes of work identify specific project objectives and strategies. The project scopes of work detailing specific research strategies are attached as separate files, as needed.

### **PROJECT LOCATION:**

The research that this HPC proposal would help fund will be conducted at the following locations:

- State Route 260 (Milepost 259-278) – Gila County; Star Valley to the Mogollon Rim
- Interstate-17 (Milepost 309-339) – Coconino County; Stoneman Lake Road to Flagstaff
- US Highway 89 (Milepost 440-458) – Coconino County; Coconino NF boundary to Gray Mountain
- State Route 64 (Milepost 185–235) – Coconino County; Williams to Tusayan

### **LAND OWNERSHIP AT PROJECT SITE (Please state specifically if PRIVATE PROPERTY and provide landowner’s name):**

All of our research activities and mitigation (e.g., fencing) will be conducted on cleared Arizona Department of Transportation right-of-way (ROW). These ROW occur on U.S. Forest Service (State Route 260, Interstate-17, State Route 64), National Park Service (Wupatki NM, US Highway 89), and State Trust lands (US Highway 89). No research and management activities will occur on private lands. No additional ROW clearances are necessary to conduct our research and commit HPC funds; ADOT will be responsible for any necessary compliance with NEPA and other laws associated with activities within their ROW.

### **IF PRIVATE PROPERTY, IS THERE A STEWARDSHIP AGREEMENT BETWEEN THE LANDOWNER AND THE DEPARTMENT?**

N/A

### **HABITAT DESCRIPTION:**

Habitat adjacent to the State Route 260 study area is dominated by ponderosa pine, and elevations range from 5,200-6,500’ elevation. Several adjacent wet meadows and riparian-stream habitats contribute

substantially to wildlife-highway conflicts. Our Interstate-17 study area ranges from 5,000' elevation near the Stoneman Lake turnoff, with vegetation dominated by pinyon-juniper woodland, to ponderosa pine-dominated forest along most of the highway at 7,000-7,200' elevation. Like State Route 260, several adjacent meadows and riparian-stream habitats contribute substantially to wildlife-highway conflicts here. Our US Highway 89 study area ranges from dense pinyon-juniper woodland interspersed with ponderosa pine at the northern boundary of the Coconino National Forest (at 7,000' elevation) to open grasslands interspersed with junipers at 5,000' elevation. The southern and northern portions of State Route 64 project areas are dominated by ponderosa pine forest at 7,000-7,300' elevation. The central portion of this highway (6,000' elevation) is a mix of open grasslands and pinyon-juniper woodland.

#### **ITEMIZED USE OF FUNDS:**

Requested HPC funds will be used as non-Federal matching funds against ADOT funding to address various wildlife-highway research objectives. These funds will be used for the following:

▪ Purchase of GPS telemetry collars to be placed on elk, mule deer, and pronghorn	\$60,000
▪ Purchase and installation of highway traffic counters	\$10,000
▪ Helicopter capture of pronghorn and mule deer	\$5,000
▪ Supplies (traps, bait, etc.) for capture of elk	<u>\$5,000</u>
<b>Total funds</b>	<b>\$80,000</b>

#### **LIST COOPERATORS AND DESCRIBE POTENTIAL PARTICIPATION:**

Current cooperators and their participation roles in our research projects include:

- Arizona Department of Transportation (funding, highway conflict resolution)
  - ✓ Arizona Transportation Research Center
  - ✓ Office of Environmental Services (e.g., Natural Resources Management Section)
  - ✓ Flagstaff District
  - ✓ Prescott District
- Federal Highway Administration (funding, project oversight)
- U.S. Forest Service (funding, landownership)
- National Park Service – Wupatki National Monument (funding, landownership)
- Babbitt Ranches (funding, landownership)
- Arizona Elk Society (volunteer participation, promotional opportunities)
- Arizona Antelope Foundation (volunteer participation, promotional opportunities)

Future cooperators and participation roles in our research projects include:

- Rocky Mountain Elk Foundation (volunteer participation, promotional opportunities)
- Arizona Deer Association (volunteer participation, promotional opportunities)

#### **PROJECT MONITORING PLAN:**

N/A

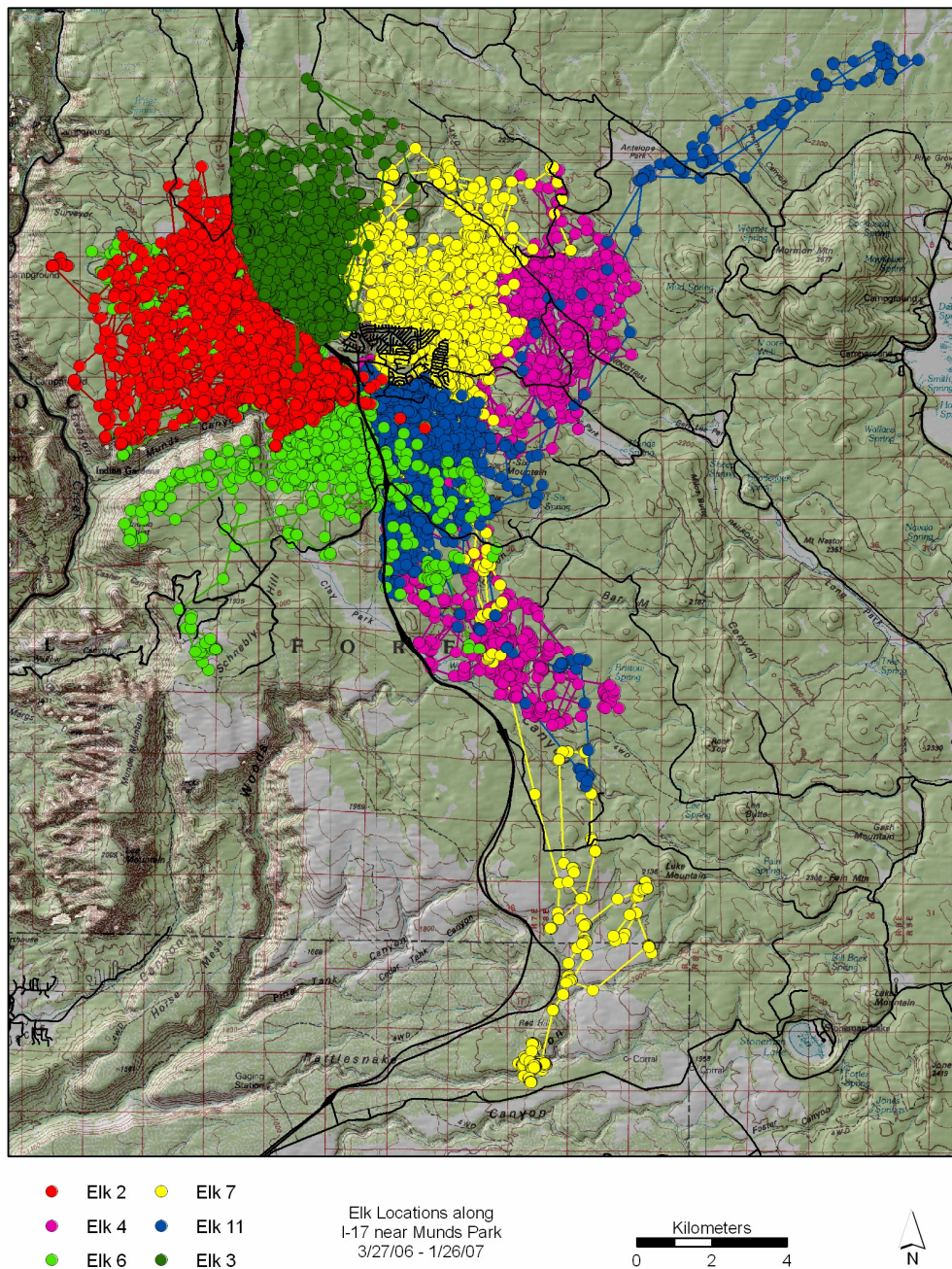
**PROJECT MAINTENANCE:**

N/A

**PROJECT COMPLETION REPORT TO BE FILED BY:**

Norris L. Dodd, Research Biologist  
Research Branch  
Arizona Game and Fish Department





Global Positioning System (GPS) fixes for 4 elk fitted with up-loadable GPS receiver collars and 2 elk from which collars were recovered along Interstate-17, south of Flagstaff in the vicinity of Munds Park. Note the barrier effect created by the highway and very few crossings of the highway by the elk. This GPS telemetry tracking was for the period March 27, 2006 through January 26, 2007.